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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/159,569	09/24/1998	RYOJI SUZUKI	P98.1699	5302

7590 02/14/2003

DAVID R METZGER ESQ
SONNENSCHN NATH & ROSENTHAL
P O BOX #061080
WACKER DRIVE STATION SEARS TOWER
CHICAGO, IL 60606

EXAMINER

WHIPKEY, JASON T

ART UNIT

PAPER NUMBER

2612

DATE MAILED: 02/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/159,569

Applicant(s)

SUZUKI ET AL.

Examiner

Jason T. Whipkey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 8-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 8-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 September 1998 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 10 December 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-6 and 8-17 have been considered but are moot in view of the new ground of rejection.

Drawings

- ✓2. The proposed drawing correction filed on December 10, 2002, has been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Specification

3. The new title and amendments to the specification are approved and their corresponding objections withdrawn.

Claim Objections

4. The amendments to the claims in response to the objections in the first action on the merits are approved and the corresponding objections withdrawn.

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- ✓5. Claim 8 is objected to as being dependent on cancelled claim 7. Correction is required. See MPEP §608.01(n).

For examination purposes, the examiner will treat claim 8 as if it is dependent on claim 5.

Claim Rejections - 35 USC § 112 and 35 USC §101

6. The amendments to the claims in response to the rejections under 35 U.S.C. 112 and 35 U.S.C. 101 are approved and the corresponding rejections under these sections withdrawn.

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 3-6, 8, and 11-17 rejected under 35 U.S.C. 103(a) as being unpatentable over Sauer in view of Koch.

Regarding claim 1, Sauer shows in Figure 4 a two-dimensional matrix of pixels. Each pixel, as shown in Figure 2, has a photodetector P11, such as a photodiode, to integrate photo-generated charge (column 5, lines 13-15). The pixel also includes a selection switch TR11 and a read-out switch TC11. Both switches read out the charge stored in photodetector 11 to a signal line (column 5, lines 24-27).

Though buffer 38 is shown to be connected to signal line 72 in Figure 4, an amplifier may also be used (column 6, lines 30-33). A separate buffer/amplifier is connected to signal line 74. The buffer/amplifier outputs an electrical signal to output signal line 30 (column 5, line 62 through column 6, line 2). Signal lines 46 and 74 have reset switches 64 and 66, respectively, for resetting the lines (column 7, lines 50-54).

Sauer is silent with regard to using a double-gated transistor in his pixels.

Koch discloses a two-dimensional image sensor (Figure 1) with a pixel configuration similar to Sauer's. Koch teaches that transistor T11', which may be considered a read-out switch, and transistor T1, which may be considered a selection switch, "can be combined in a space-saving manner to form a dual gate transistor" (column 6, lines 4-7). This reduced-space pixel structure is advantageous because a smaller image sensor may be constructed. For this reason, it would have been obvious

at the time of invention to have Sauer combine the two transistors in each pixel into a single double-gate transistor.

Regarding claims 3 and 4, Sauer teaches that the signal lines are reset before readout from the pixels begins (column 7, lines 61-64).

Regarding claim 5, Sauer shows in Figure 2 that two switches TC11 and TR11 are connected in series between photodetector P11 and the signal line.

Regarding claim 6, Sauer shows in Figure 2 that selection switch TR11 is on the side of the photodetector P11.

Regarding claim 8, Koch discloses that the gates of transistors T11' and T11 may be configured in two layers (column 6, lines 7-10).

As for claim 11, Sauer teaches that switches 40 and 44 are provided between signal lines 72 and 74, respectively, and output line 30. Since switch 40, for example, is turned on by row select line 26 and resetting of the signal line 46 is performed when charges are not being output to it (column 7, lines 61-64), resetting of signal line 46 must occur when switch 40 is off. Therefore, switch 40 allows signal line 46 to reach a reset level during a reset time by not connecting the line to output signal line 40. Additionally, switch 49 must output the signal from buffer/amplifier 38 to output signal line 40 in order for the system to be useful.

Regarding claims 12 and 13, Sauer teaches that a correlated double sampling circuit may be included (column 13, lines 50-52).

Regarding claim 14, Sauer shows in Figure 4 a two-dimensional matrix of pixels. Each pixel, shown in Figure 2, has a photodetector P11, such as a photodiode, to

integrate photo-generated charge (column 5, lines 13-15). The pixel also includes a selection switch TR11 and a read-out switch TC11. Both switches read out the charge stored in photodetector 11 to a signal line (column 5, lines 24-27). A correlated double sampling circuit may also be included in the system (column 13, lines 50-52).

Sauer is silent with regard to using a double-gated transistor in his pixels.

Koch discloses a two-dimensional image sensor (Figure 1) with a pixel configuration similar to Sauer's. Koch teaches that transistor T11', which may be considered a read-out switch, and transistor T1, which may be considered a selection switch, "can be combined in a space-saving manner to form a dual gate transistor" (column 6, lines 4-7). This reduced-space pixel structure is advantageous because a smaller image sensor may be constructed. For this reason, it would have been obvious at the time of invention to have Sauer combine the two transistors in each pixel into a single double-gate transistor.

Sauer is silent with regard to outputting a reset level followed by a signal level and calculating the difference between the two.

Koch's sensor performs correlated double sampling. In a reset state, the output of the pixels in the first sensor column, for example, is placed on line SP1, which is connected to horizontal line AL by transistor ST1 (column 5, lines 34-45). This reset signal is processed by the CDS circuitry shown in Figure 3. Actual sensor signals, including noise, are output similarly using the same circuitry (column 5, lines 49-55). The CDS circuitry then calculates the difference between the two signals to output a "clean" image signal (column 5, lines 55-58).

An advantage to performing correlated double sampling using common circuitry for transferring both reset and signal outputs is that less circuitry is needed in the pixel area of the sensor while improving image quality. For this reason, it would have been obvious at the time of invention to have Sauer's sensor use shared circuitry to perform correlated double sampling, such as that described by Koch.

Regarding claim 15, Sauer discloses that output signal line 1 and output signal line 2, which are adjacent, may be enabled simultaneously (column 9, lines 11-12). Two pixels on the same output signal line may also be enabled simultaneously (column 9, lines 1-4). This process is shown in Figure 7.

Claim 16 may be treated like claim 14. However, Sauer is silent with regard to using an optical system.

Official Notice is taken that optical systems are commonly associated with image sensors. The advantage to using an optical system with an imager is that images from a distance may be captured with great detail. For this reason, it would have been obvious to have Sauer's pixel matrix include an optical system.

Regarding claim 17, Sauer discloses that output signal line 1 and output signal line 2, which are adjacent, may be enabled simultaneously (column 9, lines 11-12). Two pixels on the same output signal line may also be enabled simultaneously (column 9, lines 1-4). This process is shown in Figure 7.

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sauer in view of Koch and further in view of Gowda.

Claim 2 may be treated like claim 1. However, both Sauer and Koch are silent with regard to using a hole accumulation diode sensor structure.

Gowda discloses a pixel circuit for an image sensor. A photodiode 26 is shown in Figure 3B. Photodiode 26 may be a pinned photodiode (column 7, lines 9-10). Official Notice is taken that a pinned photodiode is the same as a hole accumulation diode. As described in column 7, lines 18-21, the advantage of using a pinned photodiode is that it does not need to be reset after each read. For this reason, it would have been obvious for Sauer to include a pinned photodiode, such as the one described by Gowda.

11. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sauer in view of Koch and further in view of Munier.

Claim 9 may be treated like claim 1. However, both Sauer and Koch are silent with regard to connecting the read-out switch between the photodetector and the signal line and connecting the selection switch to a control electrode of the read-out switch and a read-out pulse line.

Munier shows an image sensor in Figure 2 with read-out transistor $T_{1,12}$ connected between photodiode D_{12} and electrode S_2 . Selection transistor $T_{2,12}$ is connected to the control electrode of transistor $T_{1,12}$ and address line Y_3 .

An advantage to this transistor configuration is that random pixel access is possible. For this reason, it would have been obvious for Sauer's pixel matrix to utilize the transistor configuration taught by Munier.

Regarding claim 10, Sauer, Koch, and Munier are silent with regard to using a depression MOS transistor as the selection switch.

Official Notice is taken that depression-type MOSFETs require a lower voltage across the source and drain. Therefore, the advantage to using a depression-type MOSFET is that it has reduced power requirements. For this reason, it would have been obvious to have Munier's selection switch use a depression-type MOSFET.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason T. Whipkey, whose telephone number is (703) 305-1819. The examiner can normally be reached Monday-Friday from 8 A.M. to 5:30 P.M. eastern daylight time, alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy R. Garber, can be reached on (703)305-4929. The fax phone number for the organization where this application or proceeding is assigned are (703) 872-9314 for both regular communication and After Final communication.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office, whose telephone number is (703) 306-0377.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to (703) 872-9314 for either formal or informal communications intended for entry. (For informal or draft communications, please label "**PROPOSED**" or "**DRAFT**".)

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Hand-delivered responses should be brought to the sixth floor receptionist of
Crystal Park II, 2121 Crystal Drive in Arlington, Virginia.

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February 10, 2003


WENDY R. GARBER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600